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Group Art Unit: 2826

REMARKS

Interview Summary

The Applicants gratefully acknowledge Examiner Leonardo Andujar's call on Thursday, August 11, 2005, to Mikio Ishimaru, Reg. No. 27,449, to discuss a possible amendment to the application. Mikio Ishimaru called Examiner Andujar on Monday, August 15, 2005, to further discuss such an amendment.

The Amendment of June 3, 2005, regarding claim 7 to insert "a stepped opening" in the first stop layer created a 35 USC §112 problem. Upon review, it was determined that the insertion needed to be to the second stop layer in claim 8.

Applicants, therefore, proposed language, which the Examiner recommended filing as a Supplemental Amendment.

Allowable Subject Matter

In the Office Action mailed February 25, 2005, the Examiner indicated that claims 8 and 9 would be allowable if rewritten to overcome the rejection(s) set forth below under 35 U.S.C. 112, 1st paragraph, and to include all of the limitations of the base claim and any intervening claims.

Regarding claims 8 and 9, Applicants appreciate this indication of allowable subject matter. Claim 7 is believed to be allowable because it has been amended to include allowable subject matter from claim 8. Claim 9 has been amended to depend from claim 7. Claims 8 and 9 are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim non-obvious combinations thereof.

Claims 15 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form, including all of the limitations of the base claim and any intervening claims.

Regarding claims 15 and 16, Applicants appreciate this indication of allowable subject matter. Claim 14 is believed to be allowable because it has been amended to include

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allowable subject matter from claim 15. Claim 16 has been amended to depend from claim 14. Claims 15 and 16 are believed to be allowable since they contain all the limitations set forth in independent claim 14 from which they depend and claim non-obvious combinations thereof.

Claim Rejections - 35 USC §103

Claims 7, 10-14 and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pramanick et al. (US 6,239,021, hereinafter "Pramanick") in view of Harper et al. (US 6,300,236, hereinafter "Harper").

The Examiner states:

"Regarding claims 7 and 14, Pramanick (e.g. fig. 2 & claim 1) shows an integrated circuit comprising: a substrate 108 having a semiconductor device (e.g. fig. 1; col. 1/lis. 17-23 & col. 3/lis. 33-58); a device dielectric layer 110 over the substrate; a first channel stop layer 114 over the substrate and the device dielectric layer having a portion open to the semiconductor device; a first channel dielectric layer 116 over the first channel stop layer having a first channel opening provided therein having sidewalls in the first channel dielectric layer; a first conformal barrier liner 123 in the opening, acting as barrier to diffusion of conductor core material to the first channel dielectric layer; a treated area 124 on the first conformal barrier liner and the first channel stop layer to increase adhesion properties thereof; and a first conductor core 120 in the opening over the vertical portions of the first conformal barrier liner and the first channel stop layer, the first conductor core connected to the semiconductor device. Pramanick does not teach that the first conformal barrier liner has only vertical portions on the sidewalls of the first opening in the first channel dielectric layer. However, Harper (e.g. fig. 2b) teaches a first conformal barrier liner 15 having only vertical portions on the sidewalls of a first opening 14 in a first channel dielectric layer 11 b. According to Harper, this type of embodiment improves the device electromigration lifetime (col. 1/lis. 19-67; col. 2/lis. 1-62). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the first conformal barrier liner having only vertical portions on the sidewalls of a first opening in the first channel dielectric layer disclosed by Pramanick in accordance with Harper's invention in order to improve the electromigration life of the device."

Regarding claims 7 and 14, as exemplified in claim 7, the claimed combination has been amended to include the following limitation not taught or suggested in either Pramanick or Harper of:

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"a second stop layer over the first dielectric layer and having a stepped opening provided therein;"

Thus, claims 7 and 14 are allowable under 35 U.S.C. 103(a) as being patentable over Pramanick in view of Harper because:

"[T]he prior art reference (or references when combined) must teach or suggest all the claim limitations." [bold for clarity] *In re Vaeck*, 947 F2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

Regarding claims 10-13 and 17-20, these dependent claims respectively depend from independent claims 7 and 14, and are believed to be allowable since they contain all the limitations set forth in the independent claim from which they depend and claim additional unobvious combinations.

Other

Claim 19 has been amended to insert a space left out during a previous amendment.

The Examiner stated that the prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al (US 6,486,059, hereinafter "Lee") does not have a stop layer with a stepped opening, but rather has an anti-reflective coating 40 and a stop layer 38 (Lee col. 3, lines 53-55).

The above and other references cited by the Examiner showing the prior art have been considered and are not believed to disclose, teach, or suggest, either singularly or in combination, Applicants' invention as claimed

Conclusion

In view of the above, it is submitted that the claims are in condition for allowance and reconsideration of the rejections is respectfully requested. Allowance of claims 1-20 at an early date is solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this

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paper, including any extension of time fees, to Deposit Account No. 50-0374 and please credit any excess fees to such deposit account.

Respectfully submitted,



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